Reply to the comment on the article "Selective-Targeted Extra-Intracranial Bypass Surgery in Complex Middle Cerebral Artery Aneurysms: Correctly Identifying the Recipient Artery Using Indocyanine Green Videoangiography"

Esposito, Giuseppe ; Regli, Luca

DOI: https://doi.org/10.1227/NEU.0000000000000280

Reply to the Comment on the Article "Selective-Targeted Extra-Intracranial Bypass Surgery in Complex Middle Cerebral Artery Aneurysms: Correctly Identifying the Recipient Artery Using Indocyanine Green Videoangiography

Giuseppe Esposito, MD, Luca Regli, MD

Department of Neurosurgery, University Hospital Zurich, Zurich, Switzerland.

Corresponding author:
Dr. G. Esposito, MD
Department of Neurosurgery
University Hospital Zürich
Frauenklinikstrasse 10 - CH-8091 Zürich
Tel: +41-44-2551649 - Fax: +41-44-2554505
Email: giuseppe.esposito@usz.ch

Key words: Complex intracranial aneurysms, Extra-intracranial bypass, Giant middle cerebral artery aneurysms, Indocyanine green videoangiography, Selective-targeted bypass, Recipient artery, Superficial temporal artery to middle cerebral artery bypass

Bypass surgery plays a very important role in the management of complex middle cerebral artery (MCA) aneurysms not amenable to selective clipping or coiling or other endovascular procedures. The goal of a bypass is the preservation of blood flow in the territory fed by the vessel that needs to be occluded for final aneurysm treatment (1).

Identification of the correct bypass recipient could be obtained by microsurgical dissection of both the peri-aneurysmal angioanatomy and the Sylvian fissure [2]. When dissection of the Sylvian fissure is considered at risk or when a superficial cortical recipient artery (namely a M4 segment of MCA) is preferred as recipient, it is then very important that the cortical recipient artery represents a distal branch of the trapped vessel indeed. Angioanatomical landmarks, neuroimaging, neuronavigation and stereotactic modalities represent useful tools [3, 4] to identify the correct recipient, however, the risk of revascularization into a wrong territory still exists, with possible subsequent severe ischemic effects (1, 3).

We recently reported about the feasibility and efficiency of a technique for selective-targeted revascularization, namely for the identification and targeting of the cortical recipient in extra-

to-intracranial (EC-IC) bypass surgery for treatment of complex MCA aneurysms (1). The technique is based on the use of microscope-integrated near-infrared Indocyanine Green Video Angiography (ICG-VA). We have reported our clinical experience in 7 consecutive patients treated for complex MCA aneurysms. This technique enables the correct identification of the cortical recipient arteries (cortical branches of the trapped MCA segment) in all the patients and eliminates the risk of erroneous revascularization of non-involved territories. Patients underwent successful treatment of the aneurysm, including a cortical bypass; no ischemic complications were reported and a favorable clinical outcome was achieved in all patients (modified Rankin Scale at follow-up ≤ modified Rankin Scale pre-operative). This technique can be applied in the treatment both of proximal and distal complex MCA aneurysms (1).

We then thank dr. Andreas Gruber (Vienna, Austria), dr. Duke Samson and dr. Kim Rickert (Dallas, Texas), and dr. Laligam N. Sekhar (Seattle, Washington) for their comments and contribution (1).

From part of the comment of dr. Sekhar we realized that the illustrations of the case example 2 (see Original Publication) may have been somewhat misleading. Dr. Sekhar stated that “in the case example 2 we decided to accept the sacrifice of the anterior temporal artery, even with the knowledge that it will lead to infarction of that portion of the brain”. In fact, we did not sacrifice the anterior temporal artery. We only occluded it “temporarily”, to perform a provocative ICG-VA in order to avoid the selection of a cortical recipient representing a branch of the anterior temporal artery itself. This step was useful for extra verification and represents an application of the technique to identify “uninvolved” cortical arteries. To better illustrate the treatment strategy applied in this case, we supply this letter with a new schematic drawing (Figure 1).

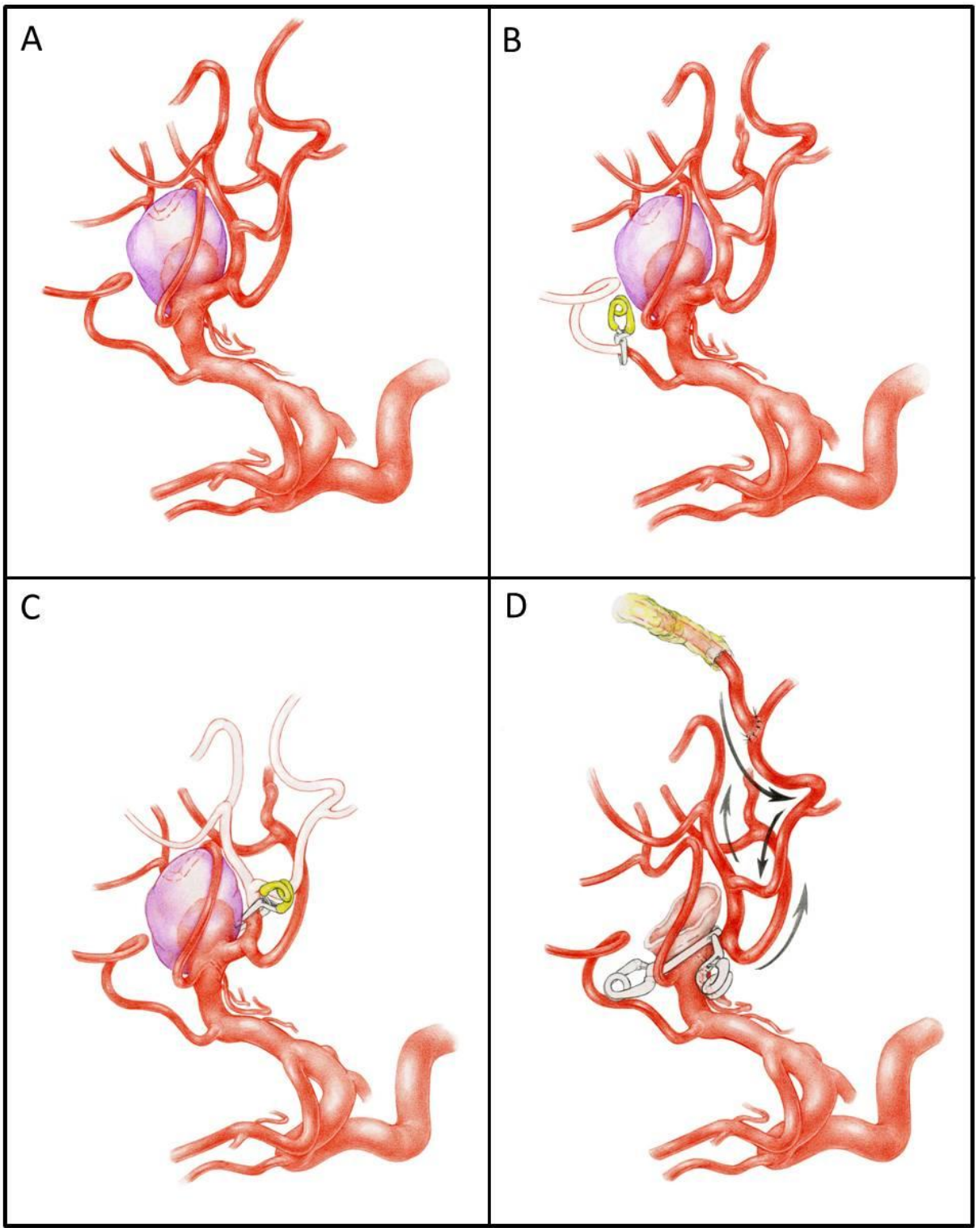

FIGURE 1

A. Drawing illustrating the partially thrombosed giant MCA (M1) bifurcation aneurysm and the perianeurysmal angioanatomy.

B. Same drawing after placement of a temporary clip on the anterior temporal artery, to perform a provocative ICG-VA in order to identify “uninvolved” cortical arteries

(namely peri-Sylvian fissure cortical arteries not representing distal branches of the artery that needs to be occluded for the final aneurysmal treatment).

C. Same drawing after removal of the temporary clip on the anterior temporal artery and placement of a temporary clip on M2 segment of the MCA, to perform a provocative ICG-VA to identify the correct cortical recipient (a cortical artery representing a branch of the artery that needs to be occluded for the final aneurysmal exclusion).

D. Same drawing illustrating permanent clips used for final aneurysm exclusion and the role of the bypass in revascularizing vessels coming from the permanently occluded aneurysmal branch. The anterior temporal artery was preserved.

REFERENCES

1. Esposito G, Durand A, van Doormaal T, Regli L (2012). Selective-targeted extra-intracranial bypass surgery in complex middle cerebral artery aneurysms: correctly identifying the recipient artery using Indocyanine Green video-angiography. Neurosurgery: Dec 71 (2 Suppl Operative): ons 274-284; discussion ons 284-285
2. Lawton MT, Hamilton MG, Morcos JJ, Spetzler RF. Revascularization and aneurysm surgery: current techniques, indications, and outcome. Neurosurgery. 1996;38(1):83-94.
3. van Doormaal TP, van der Zwan A, Verweij BH, Regli L, Tulleken CA. Giant aneurysm clipping under protection of an excimer laser-assisted non-occlusive anastomosis bypass. Neurosurgery. 2010;66(3):439-447; discussion 447.
4. Carvalho FG, Godoy BL, Reis M, et al. Frameless stereotactic navigation for intraoperative localization of infectious intracranial aneurysm. Arq Neuropsiquiatr. 2009;67(3B):911-913.

Disclosure

The authors declare that they have no conflict of interest.

The authors report no personal financial or institutional interest in any of the drugs, materials, or devices mentioned in this article.

The authors thank Mr. Peter Roth (Department of Neurosurgery, University Hospital Zurich, Zurich, Switzerland) for the drawings in Figure1.